



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material<sup>®</sup> 1359b

#### Coating Thickness Standard

(Nonmagnetic Coating on Steel)

Set Serial No. 135919990001

This Standard Reference Material (SRM) consists of a preconfigured set of four 45 mm × 45 mm coupons certified for total coating thickness (nominal thicknesses of 48 μm, 140 μm, 505 μm, and 800 μm). It is designed for calibrating thickness gauges that employ magnetic principles. These gauges are used to measure the thickness of nonmagnetic coatings on steel including paint and other organic coatings, as well as nonmagnetic metallic coatings. Each coupon consists of an AISI 1010 cold-rolled sheet steel substrate with a uniform coating of copper that is overplated with a thin protective layer of chromium. This SRM is one in a series of six sets prepared to cover a thickness range from 6 μm to 1935 μm. The sets in this series are SRMs 1358b, 1359b, 1361b, 1362b, 1363b, and 1364b.

Table 1. Certified Coating Thickness Values and Uncertainties for Each Coupon

Individual Coupon Serial Number	Certified Coating Thickness	
	(μm)	(mils)
130719990001	49.8 ± 0.7	1.96 ± 0.03
131119990001	136 ± 2.0	5.36 ± 0.07
131519990001	471 ± 4.7	18.6 ± 0.2
131719990001	784 ± 7.8	30.9 ± 0.3

Assembly Date: 14 April 1999

**Certified Values and Uncertainties:** The analytical methods used for the characterization and subsequent certification of this SRM included flame atomic absorption spectrometry, optical microscopy, and magnetic induction. The resulting certified values are based upon results from the magnetic induction technique and are reported as the mean thickness of each coupon of the SRM unit. The uncertainty in the certified thickness for each coupon is expressed as the expanded uncertainty,  $U$ , of the mean at the 95 % level of confidence and is calculated according to the method described in the ISO Guide [1], where  $U = ku_c$ , with a coverage factor of  $k = 2$ , and  $u_c$  is the combined uncertainty, including the estimated uncertainties of the primary standards and the imprecision of the intercomparison of the primary standards to the coupon.

**Expiration of Certification:** The wear induced by the contact measurement of the magnetic gauges will alter the thickness values stated in this certificate. The frequency of replacement or verification of this SRM is determined by the user, based upon the number of uses and the severity of use. If excessive wear is suspected, the SRM may be returned to NIST for verification. To verify certification of this SRM unit, contact the NIST Electrochemical Processing Group by e-mail at [Coating.Thickness@nist.gov](mailto:Coating.Thickness@nist.gov), by telephone at (301) 975-6400, or by fax at (301) 926-7679.

The support aspects involved with the original certification and issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by R.J. Gettings and C.R. Beauchamp.

Carol A. Handwerker, Chief  
Metallurgy Division

Gaithersburg, MD 20899  
Certificate Issue Date: 13 November 2001  
*See Certificate Revision History on Last Page*

John Rumble, Jr., Acting Chief  
Standard Reference Materials Program

The overall direction of the technical measurements leading to certification of this SRM were provided by G.R. Stafford of the Electrochemical Processing Group of the NIST Metallurgy Division.

This SRM was produced by D.R. Kelley and measured by H.B. Gates of the Electrochemical Processing Group of the NIST Metallurgy Division.

Statistical analysis was provided by S.D. Leigh of the NIST Statistical Engineering Division.

**Caution to User:** This SRM should **NOT** be left unprotected in a corrosive laboratory environment or undergo any treatment that would scratch or remove material from the surface of the coupon. The surfaces of these coupons require careful preservation and care during storage and use to maintain the stated thickness within the uncertainty reported on this certificate.

**Instrument Calibration:** Published standard magnetic methods for measuring coating thicknesses [2,3] should be used as guidelines to maximize thickness measurement accuracy. It is generally not possible for the user to achieve the same uncertainty reported in Table 1 of this certificate when using magnetic-type thickness gauges calibrated with this coating thickness SRM. The overall uncertainty of the measurement by the user will include the contribution due to the uncertainty of this SRM, as well as the uncertainties inherent in the measurements performed by the user.

#### REFERENCES

- [1] *Guide to the Expression of Uncertainty in Measurement*, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland, (1993); see also Taylor, B.N. and Kuyatt, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, U.S. Government Printing Office, Washington DC, (1994); available at <http://physics.nist.gov/Pubs/>
- [2] ASTM B 499-96, "Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals," Annual Book of ASTM Standards, **02.05**, West Conshohocken, PA, (1996).
- [3] "Nonmagnetic Coatings on Magnetic Substrate-Measurement of Coating Thickness-Magnetic Method," ISO 2178; International Organization for Standardization; available from American National Standards Institute at <http://www.ansi.org/>.

<b>Certificate Revision History:</b> 13 November 2001 (editorial change); 18 June 1999 (original certificate date).
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*Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; e-mail [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet <http://www.nist.gov/srm>.*